

REMARKS

The application includes claims 1-14 prior to entering this amendment.

The examiner rejected claims 1-2, 5-9, 12, and 14 under 35 U.S.C. § 102(b) as being anticipated by Yuan (U.S. Patent 5,367,385).

The examiner rejected claim 13 under 35 U.S.C. § 103(a) as being unpatentable over Yuan in view of Lee (U.S. Patent 6,226,050).

The examiner rejected claim 3-4 under 35 U.S.C. § 103(a) as being unpatentable over Yuan in view of Doi et al. (U.S. Patent 5,343,390).

The applicant amends claims 1, 5 and 8. New claims 15-20 are added to more completely claim the invention. The application remains with claims 1-20 after entering this amendment. Claims 10-11 were allowed.

The applicants add no new matter and requests reconsideration.

Claim Rejections Under 35 U.S.C. § 102

The examiner rejected claims 1-2, 5-9, 12, and 14 under 35 U.S.C. § 102(b) as being anticipated by Yuan (U.S. Patent 5,367,385). Applicant respectfully traverses the rejections for the following reasons. Yuan teaches “seam filter” **35** for filtering or modifying block edge pixels to reduce boundary artifacts between adjacent image blocks.¹ According to Yuan, a local or “internal pixel” near a block boundary but inside the block is selected, and an “external pixel,” i.e., one in the adjacent block is selected. “The selected local pixel is modified to reduce the difference between the local pixel and the selected external pixel(s).”²

Applicant’s claim 1 is not directed to block boundary artifacts. Rather, it seeks to reduce ringing or noise that results from compression of pixel data defining an edge feature within a single block. Moreover, even if Yuan could be applied within a single block of pixel data, Yuan teaches modifying the selected pixels to reduce the difference measured across the block boundary. The present invention, by contrast, seeks to preserve the distinct edges or lines in the pixel data while reducing ringing artifacts. The issue is entirely different: Yuan teaches filtering pixel values to subdue the artifacts caused by arbitrary block boundaries. In the present

¹ See Abstract.

² See Abstract, and column 1, lines 43-53; Column 6, lines 13-33.

application, the goal is to reduce noise, but still preserve the sharp edges necessary to picture fidelity. The dominant edges themselves are not artifacts at all; rather, they are important parts of the original image data. Thus it is important to note that “edges” that occur in the pixel data content are not the same as block boundaries, which of course are created arbitrarily for encoding convenience.

In this regard, Applicant explained that:

“The invention exploits the fact that artifacts near dominant edges has a direction that can be inferred from a main direction of the dominant edge. The invention teaches to filter the image data on either side of the pixels containing the edge. ... It will be appreciated that the dominant edges of the image are therefore not smoothened, since they themselves are not filtered.”³

Claim 1 is currently amended to clarify that it calls for NOT filtering the edge pixels themselves. It recites, in pertinent part:

“identifying a first one of the pixels that stores image data corresponding to an image edge aligned with an identified one of the base directions;

“selecting a directional de-ringing filter having at least one main filter direction perpendicular with the identified base direction; and

“applying the selected directional de-ringing filter to the image data of at least a second one of the pixels located adjacent to the identified first pixel, so that the pixel that stores image data corresponding to the image edge is not itself filtered.”

For example, with regard to Fig. 1, the Specification explains that, “According to a box 140, even though unfiltered, the image data of the identified pixels is output. This will prevent smoothing of the dominant edge of the image.”⁴ For at least the foregoing reasons, claims 1-2 should be allowed.

Regarding **claim 5**, it too is amended to clarify that it calls for NOT filtering the edge pixels themselves. recites, in pertinent part:

“identifying a first one of the pixels that stores image data corresponding to an image edge that has a preset edge direction;

³ Summary of the Invention, specification at page 2.

⁴ Specification at page 4, paragraph 3.

“selecting a directional de-ringing filter having at least one main filter direction perpendicular with the preset edge direction; and

“applying the selected directional de-ringing filter to the image data of at least a second one of the pixels located adjacent to the identified first pixel, so that the first pixel that stores image data corresponding to the image edge is not itself filtered.”

For at least the foregoing reasons, claims 5-9 should be allowed.

Further regarding **claim 7**, the examiner misapprehends the disclosure of Yuan. The reference says, in pertinent part: “To illustrate the operation of seam filter 30, the following describes the smoothing of an outer boundary pixel 72 near a border 60 between blocks 40 and 46 (FIG. 4). [¶] The pixels within the image 12 are arranged in columns. As shown in FIG. 4, to smooth pixel 72, filter 30 selects a pixel from column A to the left of pixel 72, and a pixel from each of the two columns C, D to the right of pixel 72 (e.g., from adjacent block 46). As explained more fully below, the filter replaces pixel 72 with a smoothed pixel value derived from the values of pixel 72 and the three selected pixels.”⁵

Importantly, Yuan thus teaches *replacing* the pixel value of the pixel 72 adjacent the block border. **Claim 7** describes just the opposite. It recites:

“7. (Original) The method of claim 5, further comprising:

“identifying a third one of the pixels that stores image data that does not correspond to an image edge that has the preset edge direction, and

“applying the selected directional de-ringing filter to the image data of the third pixel.”

Note that in the express claim language, the third pixel “stores image data that does not correspond to an image edge.” It must be kept in mind that, in the present application, an “edge” refers to a feature in the image data, perhaps a line between light and dark regions, rather than an arbitrarily-defined encoding block boundary. In Yuan, the pixel 72 *does* correspond to a block boundary. In this way, the claim describes an invention that departs from the prior art in at least two significant ways. First, Yuan works to reduce block boundary artifacts, rather than preserve legitimate edge features, as explained above; and second, even if *arguendo* edges and block boundaries were interchangeable (which clearly they are not), claim 7 expressly calls for not

⁵ Yuan at column 6, lines 22-33 (emphasis added).

changing the edge pixels, while Yuan teaches filtering them. Yuan cannot be said to anticipate this claim. For at least these additional reasons, claim 7 should be allowed.

Claims 8 and 9

DIRECTIONAL BOUNDARY FILTERING DISCLOSED IN YUAN DOES NOT SUGGEST THE DIRECTIONAL DE-RINGING FILTERING METHOD OF CLAIMS 8 AND 9

Yuan describes determining a “direction of smoothing” for filtering pixels along a block boundary:

“To select pixels from each of the neighboring columns, the filter first determines a direction in which smoothing is to be performed. For example, to smooth in a direction perpendicular to border 60, the filter selects pixels 70, 74, 76 which form a line perpendicular to the border. To smooth at a 45° angle, the filter selects pixels 78, 80, 82 which together with pixel 72 form a line at a 45° angle to the border. Similarly, to filter at a 135° angle, the filter selects pixels 84, 86, 88 which together with pixel 72 form a line at a 135° angle to the border.”⁶

Yuan FIG. 4 is shown below, in which line **60** is a block boundary or border. Yuan employs an edge detector to find edges or lines in the data, and then determines the approximate angle of the edge relative to the block border. Pixels are selected for filtering that lie along the desired angle for smoothing.⁷ Thus, the smoothing direction in Yuan, which crosses over the block boundary, is quite different from the main direction of the present applicant’s de-ringing filter, which is only applied to pixels alongside a dominant edge detected within a block of pixels. Moreover, Yuan’s technique to “tone down” artifacts along the block border is quite

New **claim 20** is broader than claim 10 and is clearly patentable over Yuan. It recites:

“20. (New) A method for generating filtered image data corresponding to an image from respective unfiltered image data stored in a plurality of respective pixels, the method comprising:

selecting a block of pixels;

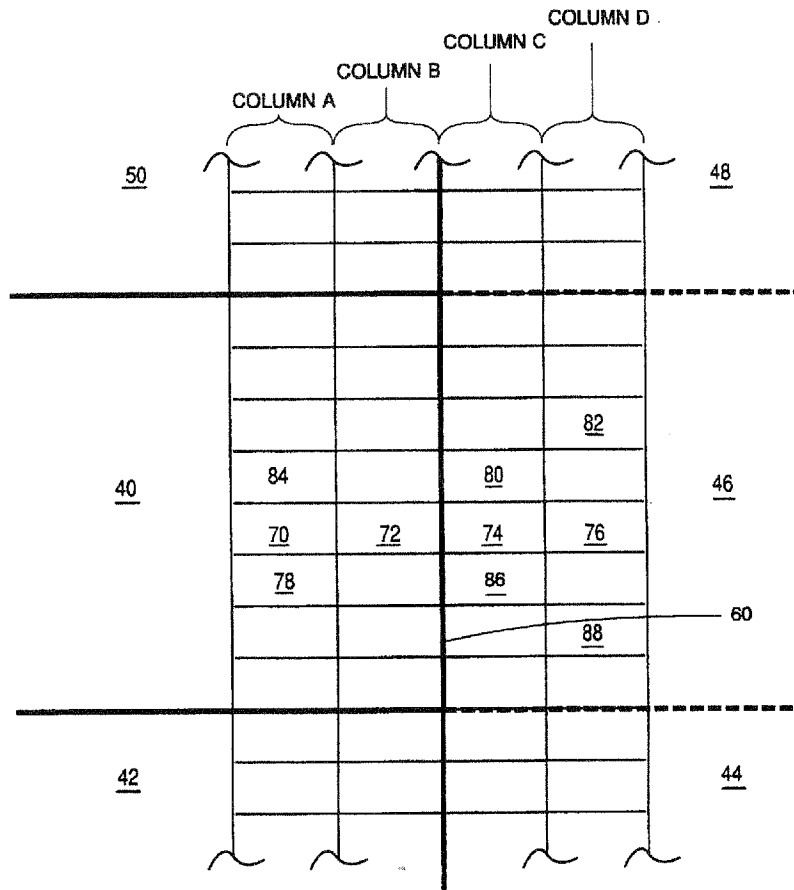
determining whether a dominant edge can be detected within the block of pixels;

if a dominant edge is detected within the block of pixels, determining an associated angle of the detected dominant edge; and

⁶ Column 6, lines 34-43.

⁷ Column 6, lines 44-50.

if a dominant edge is detected within the block of pixels, applying a directional de-ringing filter only to selected pixels within the block, wherein the selected pixels are those lying within the block to either side of the pixels that contain the dominant edge, so that the pixels that contain the dominant edge are not filtered, and wherein the de-ringing filter has a main direction perpendicular to the angle of the detected dominant edge.”



Yuan does not teach finding a *dominant* edge, and does not teach *applying a directional de-ringing filter*, as claimed, only to selected pixels within the block, wherein the selected pixels are those *lying within the block to either side of the pixels that contain the dominant edge*, so that the pixels that contain the dominant edge are not filtered, and wherein the de-ringing filter has a main direction perpendicular to the angle of the detected dominant edge. For at least these reasons, claim 20 should be allowed.

Claim 8 is amended to depend from new claim 20. For the foregoing reasons, it is not anticipated by Yuan. Moreover, as the Examiner noted, Yuan does not disclose convolving the pixel data with directional masks to classify the edge content as described in claims 8 and 9.⁸

Claim Rejections Under 35 U.S.C. § 103

Regarding **Claim 13**, it is not argued as being separately patentable apart from the base claim.

Claims 3-4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yuan in view of Doi et al. (U.S. Patent 5,343,390). Claim 3 calls for, “computing the edge content in each of the base directions; and comparing the edge contents of each direction to each other.” The cited reference (Doi) discloses *accumulating* edge gradient values, but it does not teach computing edge content (or gradients) in at least two directions, and then comparing the results to each other as claimed, to find a dominant direction. It merely compares accumulated edge gradients to stored data for medical diagnostic purposes.⁹ Regarding **claim 4**, it is not seen where the reference discloses either “determining a maximum edge content statistic” or the claimed step of, “comparing the determined maximum edge content statistic to a threshold smoothness.” It is respectfully submitted that the Examiner has not made out a *prima facie* showing of obviousness as to these claims. The rejection should be reconsidered and withdrawn.

⁸ See Specification at pages 5-6.

⁹ Doi at column 13, line 64 – column 14, line 7.

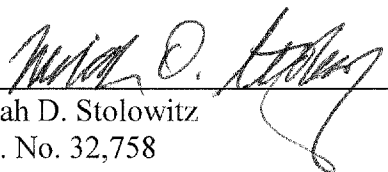
Conclusion

For the foregoing reasons, reconsideration and allowance of claims 1-9 and 12-20 of the application as amended is requested. (Claims 10-11 stand allowed.) The examiner is encouraged to telephone the undersigned at (503) 224-2170 if it appears that an interview would be helpful in advancing the case.

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Respectfully submitted,

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